

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-5, 7-23 and 26-44 are presently pending in this application with Claims 1-4, 8, 14, 19-23, and 26-44 being active, Claims 1, 2, 19, and 28-31 having been amended, Claims 24 and 25 canceled and Claims 32-44 added by the present Amendment; and Claims 5, 7, 9-13, and 15-18 having previously been withdrawn from consideration as directed to a non-elected invention.

In the outstanding Official Action Claims 1-3, 8 and 19-31 were rejected under 35 USC §102(e) as being anticipated by Dieny et al (6,462,641) and Claim 4 was rejected under 35 USC §103(a) as being unpatentable over Dieny et al in view of Sun et al (6,574,079).

In light of the several grounds for rejection, Claims 1, 2 and 28-31 have been amended to clarify the claimed invention and thereby more clearly distinguish over the cited art. The changes to Claim 1 find support in the specification at page 10, lines 20-28 and page 42, line 33 through page 43, line 22. The new Claims 32-44 are supported in the second embodiment (Figure 18). No new matter has been added.

As stated in amended Claim 1, the claimed magnetoresistance effect element includes a magnetoresistance, a magnetization free layer, and a non-magnetic intermediate layer provided between the magnetization fixed layer and the magnetization free layer. The non-magnetic intermediate layer includes a non-magnetic metallic layer and a resistance regulating layer stacked on the non-magnetic metallic layer, the resistance regulating layer formed in the non-magnetic intermediate layer or on the interface between the non-magnetic intermediate layer and at least one of the magnetization fixed layer and the magnetization free layer. A pair of electrodes is electrically connected to the magnetoresistance effect film for

applying a current in a direction perpendicular to the plane of the magnetoresistance effect film. As stated in amended Claim 1, the resistance regulating layer contains an oxide, a nitride, a fluoride, a carbide or a boride as a principal component and including holes of a metal phase of 2% to 30%, and the mean diameter of each of the holes of the resistance regulating layer is in the range from 10% to 100% with respect to the total thickness of the magnetization free layer, the non-magnetic intermediate layer and the magnetization fixed layer.

On the contrary, Dieny et al teaches the magnetoresistance effect element including a barrier layer 16 wherein any current conduction occurs by means of the tunnel effect. Generally, in order to obtain the tunnel effect, it is necessary for the barrier layer to be formed as few pin holes as possible.

However, Dieny et al do not disclose or suggest that the mean diameter of each of the hole of the resistance regulating layer is in the range of from 10% to 100% with respect to the total thickness of the magnetization free layer, the non-magnetic intermediate layer and the magnetization fixed layer. Indeed, there is no purpose for pin holes in a Dieny et al device where current conduction is based on tunnel effect.

In contrast, amended Claim 1 recites a specific range of sizes of pin holes to enable ohmic current conduction through the pin holes, as described in Applicants disclosure at page 16, lines 3-12 with respect to Applicants' Figure 30 disclosure. In fact, the pin holes are deliberately provided in the resistance regulating layer of the claimed magnetoresistance effect element provides a current conduction mechanism by which current conduction is controlled to desired levels. No such teaching is provided in the applied art, and accordingly, it is respectfully submitted that the outstanding rejection under 35 USC §102(e) as being

anticipated by Dieny et al has been overcome. Claim 1 and its dependent claims are therefore patentable over Dieny et al.

The deficiencies above discussed in regard to Dieny et al are not remedied by Sun et al, and therefore it is respectfully submitted that Claim 1 and its dependent claims are allowable over these references.

New Claim 32 similarly recites a magnetoresistance effect element wherein the resistance regulating layer contain an oxide, a nitride, a fluoride, a carbide or a boride as a principal component and including holes, and the magnetoresistance effect element senses a relative angle between the magnetization direction of the magnetization fixed layer and the magnetization direction of the magnetization free layer by a change of current passing through the holes. Claim 32 clearly indicates a sensing mechanism relying on current passing through pin holes, which is not taught in the applied art. Claim 32 therefore is also believed to be allowable.

Similarly, new Claim 33 recites a magnetoresistance effect element including a resistance regulating layer containing an oxide, a nitride, a fluoride, a carbide or a boride as a principal component and having a pin holes at a rate of hole area which is 50% or less, wherein the two adjacent layers which contact the resistance regulating layer have an electric conduction substantially limited to conduction through the pin holes of the resistance regulating layer. Claim 33 clearly indicates a sensing mechanism relying on current passing through pin holes, which is not taught in the applied art. Claim 33 and its dependent claims therefore also are believed to be allowable.

New Claim 39 recites a magnetoresistance effect element including a resistance regulating layer containing an oxide, a nitride, a fluoride, a carbide or a boride as a principal component and having a pin holes at a rate of hole area which is 50% or less, and at least 10

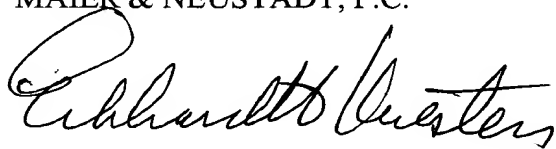
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pin holes being formed in the resistance regulating layer, a condition not taught by the cited references, whereby repeatability of element characteristics is facilitated.¹ Accordingly, Claim 39 and its dependent claims also are believed to be allowable.

Consequently, in view of the present amendment and in light of the above comments, no further issues are believed to be outstanding, and it is respectfully submitted that the present application is in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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¹ Specification, page 20, lines 12-14.